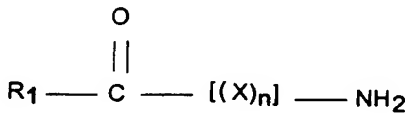
What is claimed is:

1. An antimicrobial composition comprising at least one chemically-modified peptide and a second antimicrobial compound wherein said chemically-modified peptide is represented by Formula I:

Formula I 

wherein:
X is any natural or non-natural, modified or unmodified amino acid except glutamate or aspartate;
n = 1 to 5;

(a) when said chemically-modified peptide is 1-3 amino acids, at least one amino acid is a cationic amino acid, the net charge of said peptide at neutral pH is at least +1, and said chemically-modified peptide does not contain glutamate or aspartate;

(b) when said chemically-modified peptide is 4-5 amino acids, at least two of the amino acids are cationic amino acids, the net charge of said peptide at neutral pH is at least +2, and said chemically-modified peptide does not contain glutamate or aspartate;
wherein:
R_1 is C_1-C_{20} alkyl; C_3-C_6 cycloalkyl; C_4-C_{20} alkenyl; C_4-C_{20} alkynyl; C_1-C_{20} haloalkyl; C_3-C_{20} haloalkenyl; C_3-C_{20} haloalkynyl; C_2-C_{20} alkoxyalkyl; C_2-C_{20} alkylthioalkyl; C_2-C_{20} alkylsulfinylalkyl; C_2-C_{20} alkylsulfonylalkyl; C_5-C_{20} cycloalkylalkyl; C_4-C_{20} alkenyloxyalkyl; C_4-C_{20} alkynyloxyalkyl; C_4-C_{20} (cycloalkyl) oxyalkyl; C_4-C_{20} alkenylthioalkyl; C_4-C_{20} alkynylthioalkyl; C_6-C_{20} (cycloalkyl) thioalkyl; C_2-C_{20} haloalkoxyalkyl; C_4-C_{20} haloalkenyloxyalkyl; C_4-C_{20} haloalkynyloxyalkyl; C_4-C_{20} alkoxylalkenyl; C_4-C_{20} alkoxyalkynyl; C_4-C_{20} alkylthioalkenyl; C_4-C_{20} alkylthioalkynyl; C_4-C_{20} trialkylsilylalkyl; C_1-C_{20} alkyl substituted with NR_3R_4, nitro, cyano, or phenyl optionally substituted with R_5, R_6, and R_7; C_1-C_{20} alkoxy; C_1-C_{20} haloalkoxy; C_1-C_{20} alkylthio; C_1-C_{20} haloalkylthio; NR_3R_4; or phenyl, benzyl, pyridyl, furanyl, thienyl, naphthyl, pyrimidinyl, benzofuranyl, benzothienyl, or

quinolinyl each optionally substituted with R_5, R_6 or R_7;

R_2 is C_1-C_{20} alkyl; C_3-C_6 cycloalkyl; C_4-C_{20} alkenyl; C_4-C_{20} alkynyl; C_1-C_{20} haloalkyl; C_3-C_{20} haloalkenyl; C_3-C_{20} haloalkynyl; C_2-C_{20} alkoxyalkyl; C_2-C_{20} alkylthioalkyl; C_2-C_{20} alkylsulfinylalkyl; C_2-C_{20} alkylsulfonylalkyl; C_5-C_{20} cycloalkylalkyl; C_4-C_{20} alkenyloxyalkyl; C_4-C_{20} alkynyloxyalkyl; C_4-C_{20} (cycloalkyl) oxyalkyl; C_4-C_{20} alkenylthioalkyl; C_4-C_{20} alkynylthioalkyl; C_6-C_{20} (cycloalkyl) thioalkyl; C_2-C_{20} haloalkoxyalkyl; C_4-C_{20} haloalkenyloxyalkyl; C_4-C_{20} haloalkynyloxyalkyl; C_4-C_{20} alkoxylalkenyl; C_4-C_{20} alkoxyalkynyl; C_4-C_{20} alkylthioalkenyl; C_4-C_{20} alkylthioalkynyl; C_4-C_{20} trialkylsilylalkyl; C_1-C_{20} alkyl substituted with NR_3R_4, nitro, cyano, or phenyl optionally substituted with R_5, R_6, and R_7; C_1-C_{20} alkoxy; C_1-C_{20} haloalkoxy; C_1-C_{20} alkylthio; C_1-C_{20} haloalkylthio; NR_3R_4; or phenyl, benzyl, pyridyl, furanyl, thienyl, naphthyl, pyrimidinyl, benzofuranyl, benzothienyl, or quinolinyl each optionally substituted with R_5, R_6 or R_7;

R_3 is independently hydrogen; C_1-C_4 alkyl; or phenyl optionally substituted with at least one R_8;

R_4 is independently hydrogen; C_1-C_8 alkyl; or phenyl optionally substituted with at least one R_8;

R_5 is independently C_1-C_6 alkyl; C_1-C_6 alkoxy; C_1-C_6 haloalkyl; halogen; C_2-C_8 alkynyl; C_1-C_6 thioalkyl; phenyl or phenoxy each optionally substituted with at least one R_8; cyano; nitro; C_1-C_6 haloalkoxy; C_1-C_6 haloalkythio; C_2-C_6 alkenyl; C_2-C_6 haloalkenyl; acetyl; CO_2CH_3; or $N(C_1$-C_2 alkyl$)_2$;

R_6 is independently methyl; ethyl; methoxy; methylthio; halogen; or trifluoromethyl;

R_7 is independently halogen;

R_8 is independently halogen; C_1-C_4 alkyl; C_1-C_4 alkoxy; C_1-C_4 haloalkyl; nitro; or cyano; and

wherein said second antimicrobial compound is a compound selected from the group consisting of a biocide, a germicide, an antibacterial agent, an antiviral agent, an antifungal agent and an antiparasitic agent.

2. The antimicrobial composition of claim 1 wherein said chemically-modified peptide comprises 2 amino acids, and wherein the N-terminal amino acid is a cationic amino acid and the C-terminal amino acid is any amino acid except glutamate or aspartate.

3. The antimicrobial composition of claim 1 wherein said chemically-modified peptide is selected from the group consisting of Arg-Trp; Lys-Trp; and Orn-Trp.

4. The antimicrobial composition of claim 1 wherein said chemically-modified peptide is selected from the group consisting of Arg-Phe-Arg; Lys-Phe-Arg; Lys-Phe-Lys; Arg-Phe-Lys; Orn-Phe-Arg; Orn-Phe-Orn; Arg-Phe-Orn; Arg-Trp-Phe; Lys-Trp-Phe; Orn-Trp-Phe; Arg-Trp-Cys; Lys-Trp-Cys; Orn-Trp-Cys; Arg-Phe-Trp; Lys-Phe-Trp; Orn-Phe-Trp; Arg-Arg-Trp; Lys-Lys-Trp; Lys-Arg-Trp; Arg-Lys-Trp; Orn-Orn-Trp; Orn-Arg-Trp; Arg-Orn-Trp; Arg-Trp-Arg; Lys-Trp-Arg; Arg-Trp-Lys; Lys-Trp-Lys; Orn-Trp-Arg; Arg-Trp-Orn; and Orn-Trp-Orn.

5. The antimicrobial composition of claim 1 wherein said chemically-modified peptide is selected from the group consisting of SEQ ID NO:1; SEQ ID NO:2; SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; SEQ ID NO:8; SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; SEQ ID NO:12; SEQ ID NO:13; SEQ ID NO:14; SEQ ID NO:15; SEQ ID NO:16; SEQ ID NO:17; SEQ ID NO:18; SEQ ID NO:19; SEQ ID NO:20; SEQ ID NO:21; SEQ ID NO:22; and SEQ ID NO:23.

6. The composition of claim 1 wherein said second antimicrobial compound comprises a biocide selected from the group consisting of dodecylguanidine hydrochloride; methylene bis (thiocyanate); *n*-alkyl dimethylbenzylammonium chloride; glutaraldehyde; 2,2-dibromo-3-nitrilo propionamide; 5-chloro-2-methyl-4-isothiazolin-3-one; 2-methyl-4-isothiazolin-3-one; or 2-bromo-2-nitropropane-1,3-diol; sodium or calcium hypochlorite; sodium bromide; β-bromo-β-nitrostyrene; oxazolidines; chromated copper arsenate; zinc pyrithione; copper pyrithione; a carbamate; a halohydantoin; dinonylsulfosuccinate; and sodium lauryl sulfate.

7. The antimicrobial composition of claim 6 wherein said biocide is present in an amount of about 0.0000002% to about 5% by weight of biocide based on the weight percentage of the total composition.

8. The antimicrobial composition of claim 1 wherein said additional antimicrobial compound comprises a germicide selected from the group consisting of 2,4,4' trichloro-2'-hydroxydiphenylether, 1-(4-chlorophenyl)-3-(3,4-dichlorophenyl) urea, isopropylmethylphenol, chlorhexidine hydrochloride, hexamidine diisethionate, octopirox, chloroxylenol, benzoyl peroxide, phenoxy alcohols, and hydroxybenzoic acids.

9. The antimicrobial composition of claim 8 wherein said germicide is present in an amount of about 0.0001% to about 10% by weight of germicide based on the weight percentage of the total composition.

10. The antimicrobial composition of claim 1 wherein said antibacterial agent is selected from the group consisting of a penicillin, a cephalosporin, a carbapenem, a β-lactamase inhibitor, an aminoglycoside, an aminocyclitol, a quinolone, a macrolide, a tetracycline, a glycopeptide, a lipopeptide, a lincosamide, a streptogramin, a sulfonamide, a trimethoprim, a protein antibiotic other than said peptide, a chloramphenicol, a metronidazole, a rifampin, a fosfomycin, a methenamine, an ethambutol and a pentamidine.

11. The antimicrobial composition of claim 10 wherein said antibacterial agent is present in an amount of about 0.0001% to about 10% by weight of antibiotic based on the weight percentage of the total composition.

12. The antimicrobial composition of claim 1 wherein said antiviral agent is a compound selected from the group consisting of acyclovir, a DNA synthesis inhibitor, a reverse transcriptase inhibitor, a protease inhibitor, IFN-α, and ribavirin.

13. The antimicrobial composition of claim 1 wherein said antifungal agent is a compound selected from the group consisting of a polyene, an imidazole, a triazole, and a glucan synthesis inhibitor.

14. The antimicrobial composition of claim 1 wherein said antiparasitic agent is a

compound selected from the group consisting of chloroquine, primaquine, sulfadoxine-pyrimethamine, metronidazole, pentamidine, benzinidazole and praziquantel.

15. The antimicrobial composition of claim 1 further comprising at least one carrier.

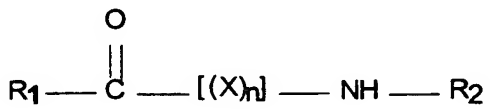
16. The antimicrobial composition of claim 15 wherein said carrier is selected from the group consisting of a pharmaceutically acceptable carrier, an industrially acceptable carrier, a household product, and a personal care composition.

17. The antimicrobial composition of claim 16 wherein said pharmaceutically acceptable carrier comprises at least one compound selected from the group consisting of waxes, cellulose derivatives, mineral oils, vegetable oils, petroleum derivatives, water, anhydrous lanolin, white petrolatum, liquid petrolatum, olive oil, ethanol and ethanol-polysorbate 80 solutions, propylene glycol-water solutions, jojoba oils, methylcellulose, paraffin, beeswax, glyceryl stearate, PEG-2 stearate, propylene glycol stearate, glycol stearate, cetyl alcohol, stearyl alcohol, and mixtures thereof.

18. The antimicrobial composition of claim 17 wherein said carrier is present in an amount of about 1% to about 99% by weight of said composition.

19. An antimicrobial composition comprising at least one chemically-modified peptide and a second antimicrobial compound wherein said chemically-modified peptide is represented by Formula II:

Formula II



wherein:

X is any natural or non-natural, modified or unmodified amino acid except glutamate or

aspartate;

n = 1 to 10;

(a) when said chemically-modified peptide is 1-3 amino acids, at least one amino acid is a cationic amino acid, the net charge of said peptide at neutral pH is at least +1, and said chemically-modified peptide does not contain glutamate or aspartate;

(b) when said chemically-modified peptide is 4-5 amino acids, at least two of the amino acids are cationic amino acids, the net charge of said peptide at neutral pH is at least +2, and said chemically-modified peptide does not contain glutamate or aspartate;

(c) when said chemically-modified peptide is 6-8 amino acids, at least three of the amino acids are cationic amino acids, the net charge of the peptide at neutral pH is preferably at least +3, and said chemically-modified peptide does not contain glutamate or aspartate; and

(d) when said chemically-modified peptide is 9-10 amino acids, at least four of the amino acids are cationic amino acids, the net charge of the peptide at neutral pH is preferably at least +4, and said chemically-modified peptide does not contain glutamate or aspartate;

wherein:

R_1 is C_1-C_{20} alkyl; C_3-C_6 cycloalkyl; C_4-C_{20} alkenyl; C_4-C_{20} alkynyl; C_1-C_{20} haloalkyl; C_3-C_{20} haloalkenyl; C_3-C_{20} haloalkynyl; C_2-C_{20} alkoxyalkyl; C_2-C_{20} alkylthioalkyl; C_2-C_{20} alkylsulfinylalkyl; C_2-C_{20} alkylsulfonylalkyl; C_5-C_{20} cycloalkylalkyl; C_4-C_{20} alkenyloxyalkyl; C_4-C_{20} alkynyloxyalkyl; C_4-C_{20} (cycloalkyl) oxyalkyl; C_4-C_{20} alkenylthioalkyl; C_4-C_{20} alkynylthioalkyl; C_6-C_{20} (cycloalkyl) thioalkyl; C_2-C_{20} haloalkoxyalkyl; C_4-C_{20} haloalkenyloxyalkyl; C_4-C_{20} haloalkynyloxyalkyl; C_4-C_{20} alkoxylalkenyl; C_4-C_{20} alkoxyalkynyl; C_4-C_{20} alkylthioalkenyl; C_4-C_{20} alkylthioalkynyl; C_4-C_{20} trialkylsilylalkyl; C_1-C_{20} alkyl substituted with NR_3R_4, nitro, cyano, or phenyl optionally substituted with R_5, R_6, and R_7; C_1-C_{20} alkoxy; C_1-C_{20} haloalkoxy; C_1-C_{20} alkylthio; C_1-C_{20} haloalkylthio; NR_3R_4; or phenyl, benzyl, pyridyl, furanyl, thienyl, naphthyl, pyrimidinyl, benzofuranyl, benzothienyl, or quinolinyl each optionally substituted with R_5, R_6 or R_7;

R_2 is C_1-C_{20} alkyl; C_3-C_6 cycloalkyl; C_4-C_{20} alkenyl; C_4-C_{20} alkynyl; C_1-C_{20} haloalkyl; C_3-C_{20} haloalkenyl; C_3-C_{20} haloalkynyl; C_2-C_{20} alkoxyalkyl; C_2-C_{20} alkylthioalkyl; C_2-C_{20} alkylsulfinylalkyl; C_2-C_{20} alkylsulfonylalkyl; C_5-C_{20} cycloalkylalkyl; C_4-C_{20} alkenyloxyalkyl; C_4-C_{20} alkynyloxyalkyl; C_4-C_{20} (cycloalkyl) oxyalkyl; C_4-C_{20} alkenylthioalkyl; C_4-C_{20}

alkynylthioalkyl; C_6-C_{20} (cycloalkyl) thioalkyl; C_2-C_{20} haloalkoxyalkyl; C_4-C_{20} haloalkenyloxyalkyl; C_4-C_{20} haloalkynyloxyalkyl; C_4-C_{20} alkoxylalkenyl; C_4-C_{20} alkoxyalkynyl; C_4-C_{20} alkylthioalkenyl; C_4-C_{20} alkylthioalkynyl; C_4-C_{20} trialkylsilylalkyl; C_1-C_{20} alkyl substituted with NR_3R_4, nitro, cyano, or phenyl optionally substituted with R_5, R_6, and R_7; C_1-C_{20} alkoxy; C_1-C_{20} haloalkoxy; C_1-C_{20} alkylthio; C_1-C_{20} haloalkylthio; NR_3R_4; or phenyl, benzyl, pyridyl, furanyl, thienyl, naphthyl, pyrimidinyl, benzofuranyl, benzothienyl, or quinolinyl each optionally substituted with R_5, R_6 or R_7;

R_3 is independently hydrogen; C_1-C_4 alkyl; or phenyl optionally substituted with at least one R_8;

R_4 is independently hydrogen; C_1-C_8 alkyl; or phenyl optionally substituted with at least one R_8;

R_5 is independently C_1-C_6 alkyl; C_1-C_6 alkoxy; C_1-C_6 haloalkyl; halogen; C_2-C_8 alkynyl; C_1-C_6 thioalkyl; phenyl or phenoxy each optionally substituted with at least one R_8; cyano; nitro; C_1-C_6 haloalkoxy; C_1-C_6 haloalkythio; C_2-C_6 alkenyl; C_2-C_6 haloalkenyl; acetyl; CO_2CH_3; or $N(C_1$-C_2 alkyl$)_2$;

R_6 is independently methyl; ethyl; methoxy; methylthio; halogen; or trifluoromethyl;

R_7 is independently halogen;

R_8 is independently halogen; C_1-C_4 alkyl; C_1-C_4 alkoxy; C_1-C_4 haloalkyl; nitro; or cyano; and wherein:

said second antimicrobial compound is a compound selected from the group consisting of a biocide, a biodispersant, a germicide, a preservative, an antibacterial agent, an antiviral agent, an antifungal agent and an antiparasitic agent.

20. The antimicrobial composition of claim 19 wherein said chemically-modified peptide is selected from the group consisting of arginine, lysine and ornithine.

21. The antimicrobial composition of claim 19 wherein said chemically-modified peptide comprises 2 amino acids wherein at least one of the amino acids is a cationic amino acid, wherein the net charge of said peptide is at least +1.

22. The antimicrobial composition of claim 19 wherein said chemically-modified peptide is selected from the group consisting of Arg-Arg; Arg-Phe; Arg-Tyr; Arg-Ala; Arg-Ile; Arg-Leu; Arg-Pro; Arg-Val; Arg-Cys; Arg-Met; Arg-Ser; Arg-Thr; Arg-Asn; Arg-Gln; Arg-Nal; Arg-His; Arg-Gly; Phe-Arg; Tyr-Arg; Ala-Arg; Ile-Arg; Leu-Arg; Pro-Arg; Val-Arg; Cys-Arg; Met-Arg; Ser-Arg; Thr-Arg; Asn-Arg; Gln-Arg; Nal-Arg; His-Arg; and Gly-Arg.

23. The antimicrobial composition of claim 19 wherein said chemically-modified peptide is selected from the group consisting of Arg-Arg-Arg; Arg-Phe-Arg; Arg-Tyr-Arg; Arg-Ala-Arg; Arg-Ile-Arg; Arg-Leu-Arg; Arg-Pro-Arg; Arg-Val-Arg; Arg-Cys-Arg; Arg-Met-Arg; Arg-Ser-Arg; Arg-Thr-Arg; Arg-Asn-Arg; Arg-Gln-Arg; Arg-Nal-Arg; Arg-Orn-Arg; Arg-His-Arg; Arg-Lys-Arg; Arg-Gly-Arg; Arg-Arg-Nal; Arg-Arg-Phe; Arg-Arg-Tyr; Arg-Arg-Ala; Arg-Arg-Ile; Arg-Arg-Leu; Arg-Arg-Pro; Arg-Arg-Val; Arg-Arg-Cys; Arg-Arg-Met; Arg-Arg-Ser; Arg-Arg-Thr; Arg-Arg-Asn; Arg-Arg-Gln; Arg-Arg-Lys; Arg-Arg-His; Arg-Arg-Orn; and Arg-Arg-Gly.

24. The antimicrobial composition of claim 19 wherein said second antimicrobial compound comprises a biocide selected from the group consisting of dodecylguanidine hydrochloride; methylene bis (thiocyanate); *n*-alkyl dimethylbenzylammonium chloride; glutaraldehyde; 2,2-dibromo-3-nitrilo propionamide; 5-chloro-2-methyl-4-isothiazolin-3-one; 2-methyl-4-isothiazolin-3-one; or 2-bromo-2-nitropropane-1,3-diol; sodium or calcium hypochlorite; sodium bromide; β-bromo-β-nitrostyrene; oxazolidines; chromated copper arsenate; zinc pyrithione; copper pyrithione; a carbamate; a halohydantoin; dinonylsulfosuccinate; and sodium lauryl sulfate.

25. The antimicrobial composition of claim 24 wherein said biocide is present in an amount of about 0.0000002% to about 5% by weight of biocide based on the weight percentage of the total composition.

26. The antimicrobial composition of claim 19 wherein said second antimicrobial compound comprises a germicide selected from the group consisting of 2,4,4' trichloro-2'-

hydroxydiphenylether, 1-(4-chlorophenyl)-3-(3,4-dichlorophenyl) urea, isopropylmethylphenol, chlorhexidine hydrochloride, hexamidine diisethionate, octopirox, chloroxylenol, benzoyl peroxide, phenoxy alcohols, and hydroxybenzoic acids.

27. The antimicrobial composition of claim 26 wherein said germicide is present in an amount of about 0.0001% to about 10% by weight of germicide based on the weight percentage of the total composition.

28. The antimicrobial composition of claim 19 wherein said antibacterial agent is selected from the group consisting of a penicillin, a cephalosporin, a carbapenem, a β-lactamase inhibitor, an aminoglycoside, an aminocyclitol, a quinolone, a macrolide, a tetracycline, a glycopeptide, a lipopeptide, a lincosamide, a streptogramin, a sulfonamide, a trimethoprim, a protein antibiotic other than said peptide, a chloramphenicol, a metronidazole, a rifampin, a fosfomycin, a methenamine, an ethambutol and a pentamidine.

29. The antimicrobial composition of claim 28 wherein said antibacterial agent is present in an amount of about 0.0001% to about 10% by weight of antibiotic based on the weight percentage of the total composition.

30. The antimicrobial composition of claim 19 wherein said antiviral agent is a compound selected from the group consisting of acyclovir, a DNA synthesis inhibitor, a reverse transcriptase inhibitor, a protease inhibitor, IFN-α, and ribavirin.

31. The antimicrobial composition of claim 19 wherein said antifungal agent is a compound selected from the group consisting of a polyene, an imidazole, a triazole, and a glucan synthesis inhibitor.

32. The antimicrobial composition of claim 19 wherein said antiparasitic agent is a compound selected from the group consisting of chloroquine, primaquine, sulfadoxine-pyrimethamine, metronidazole, pentamidine, benzinidazole and praziquantel.

33. The antimicrobial composition of claim 19 further comprising at least one carrier.

34. The antimicrobial composition of claim 33 wherein said carrier is selected from the group consisting of a pharmaceutically acceptable carrier, an industrially acceptable carrier, a household product, and a personal care composition.

35. The antimicrobial composition of claim 34 wherein said pharmaceutically acceptable carrier comprises at least one compound selected from the group consisting of waxes, cellulose derivatives, mineral oils, vegetable oils, petroleum derivatives, water, anhydrous lanolin, white petrolatum, liquid petrolatum, olive oil, ethanol and ethanol-polysorbate 80 solutions, propylene glycol-water solutions, jojoba oils, methylcellulose, paraffin, beeswax, glyceryl stearate, PEG-2 stearate, propylene glycol stearate, glycol stearate, cetyl alcohol, stearyl alcohol, and mixtures thereof.

36. The antimicrobial composition of claim 35 wherein said carrier is present in an amount of about 1% to about 99% by weight of said composition.

37. A method of preventing, inhibiting, or terminating the growth of at least one microbe comprising administering an antimicrobial amount of a composition of claims 1 or 19.